

What is claimed is:

1. A method for treating silicon nitride (Si_xN_y) films that comprises:
electron beam treating the silicon nitride film.
- 2 The method of claim 1 which further comprises heating the film to a
5 temperature in a range from about room temperature to about 700 °C.
3. The method of claim 1 wherein the step of electron beam treating
includes exposing the film to electron beam current at doses in a range from about
100 $\mu\text{C}/\text{cm}^2$ to about 10000 $\mu\text{C}/\text{cm}^2$.
4. The method of claim 1 wherein the step of electron beam treating
10 further includes exposing the film from about 0.5 minute to about 120 minutes.
5. The method of claim 1 wherein the step of electron beam treating
comprises placing the film in an ambient gas in a chamber wherein an electron beam is
formed between a cathode and an anode, and providing a cathode voltage in range from
about -5 KV to about -10 KV.
- 15 6. The method of claim 5 wherein the ambient gas is one or more of:
Ne, He, Ar, H_2 , O_2 , Kr, Xe, and N_2 .
7. The method of claim 5 wherein a pressure of the ambient gas in the
chamber and a working distance between the cathode and the anode are maintained so that
arcing does not occur between the cathode and the anode.
- 20 8. The method of claim 5 wherein the pressure of the ambient gas in
the chamber is maintained at one or more levels that provide a substantially constant
electron beam current during at least one treatment period.
9. A method for fabricating a pMOSFET that comprises steps of:
oxidizing a gate;
25 forming a gate electrode;
implanting to form shallow source/drain extensions;
forming a SiN gate sidewall;
implanting to form source/drain deep junctions; and
activating the source/drain.